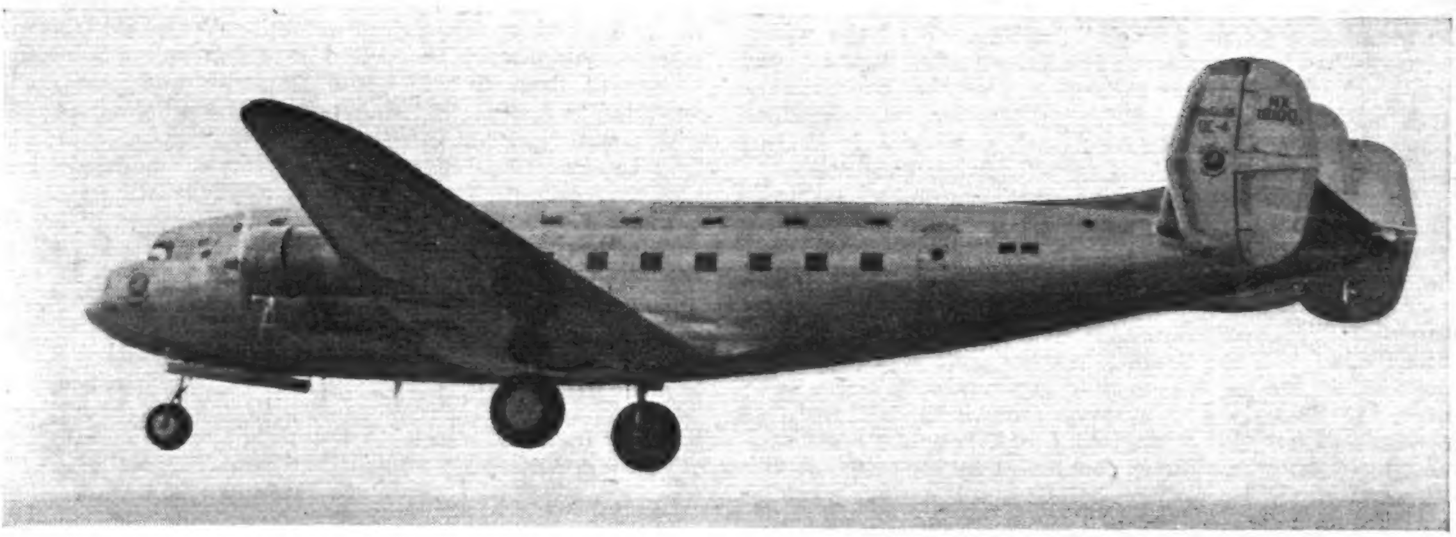


Typical of the kind of machine for which the Maclaren undercarriage is intended. The new Douglas D.C.4, which already has a tricycle landing gear and is the largest machine so fitted—a very courageous experiment in itself.

DROMES—

the moment of leaving the ground. In fact, the effect of the airscrew thrust upsets all such simple calculation. This force tends to cancel out the wind effects during the run and helps to make a fixed angle a more practical and reasonable proposition.

According to the characteristics of the machine the undercarriage might be set at different angles to suit the take-off and landing. For instance, a setting of 15-20 deg. would be theoretically correct in a 30 m.p.h. wind broadside to the track for a take-off speed of 75 m.p.h. when allowance has been made for the effects of side area and airscrew thrust. During a landing at the same speed, in which this thrust need not be considered, the correct setting would be about 23 deg. In practice the same angle would be used for both, and it seems that a maximum lock of 30 deg. would be ample for any machine other than one with very low minimum flying speeds.

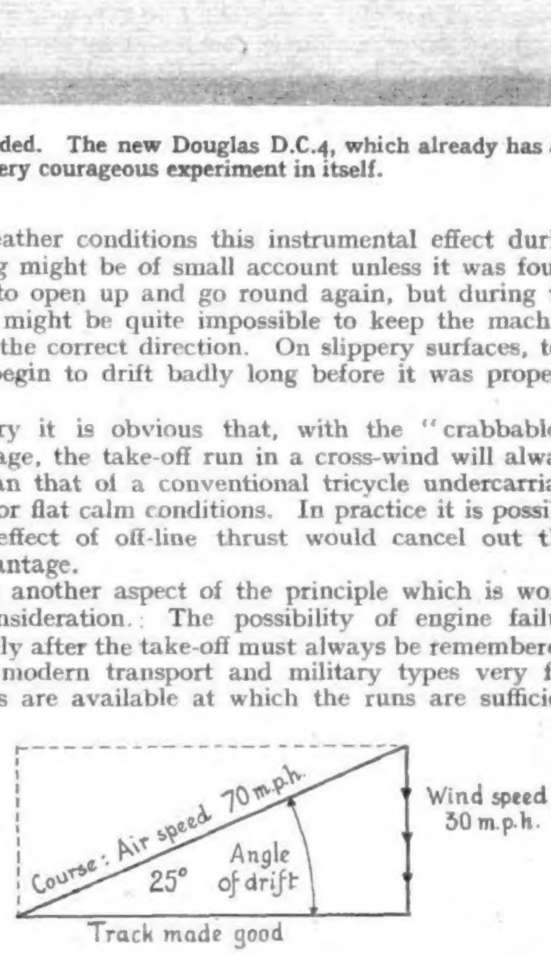
Operational Points

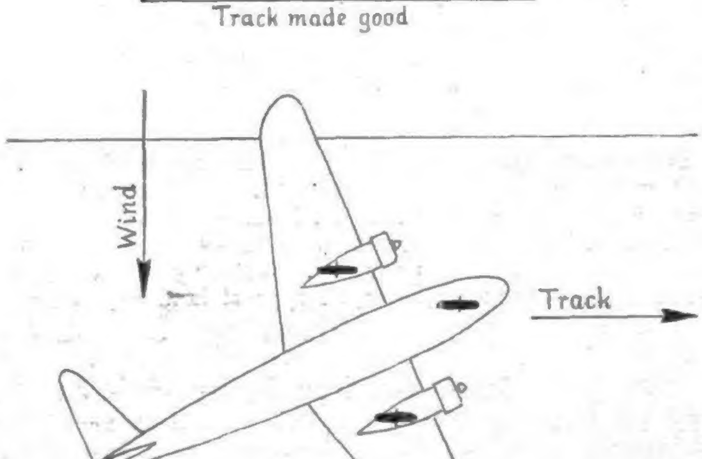
In order to obtain the best results, particularly on wet or icy surfaces, a slight modification of the usual take-off methods would be necessary. At present the pilot has to obtain the maximum possible acceleration, but with the Maclaren undercarriage any really violent increase of thrust at the start of a run would naturally apply considerable side loads on the undercarriage, since the line of thrust is not parallel with the line of travel. Such caution would not tend to increase the actual take-off run by very much, though the time would naturally be longer. One incidental advantage of less violent acceleration (and longer runways) would be that aero engines would have a longer life; practically all the wear in the engines of modern transport aeroplanes seems to take place during that initial over-drive period when the engine is being made to give much more power than is ever required in normal operation.

Although, as has already been explained, a cross-wind take-off can be made with a conventional tricycle, the side loads are very great just at the moment of leaving the ground, and in strong winds would be very difficult to control. With the Maclaren undercarriage any side loads consequent on over-violent acceleration are greatest at the lower end of the ground-speed range when wheel adhesion is at its maximum, and these loads, if the correct angle is applied, disappear entirely once the machine is properly under way. In the same manner a conventional tricycle can also be landed across wind, but here again the side loads at the moment of touch-down are considerable, and even if the undercarriage will take them and the machine remains on the track, the effect would be uncomfortable for passengers sitting well aft of the undercarriage and would alter the readings of all the gyroscopic instruments. In bad weather conditions this instrumental effect during the landing might be of small account unless it was found necessary to open up and go round again, but during the take-off it might be quite impossible to keep the machine headed in the correct direction. On slippery surfaces, too, it would begin to drift badly long before it was properly airborne.

In theory it is obvious that, with the "crabbable" undercarriage, the take-off run in a cross-wind will always be less than that of a conventional tricycle undercarriage in similar or flat calm conditions. In practice it is possible that the effect of off-line thrust would cancel out this small advantage.

There is another aspect of the principle which is worth special consideration. The possibility of engine failure immediately after the take-off must always be remembered, and with modern transport and military types very few aerodromes are available at which the runs are sufficient





The simple operation of the Maclaren undercarriage shown in its basic principles. Above is a conventional vector diagram in velocity parallelogram form with the diagonal as the angle of drift and the base as the track made good in a 30 m.p.h. side wind at an air speed of 70 m.p.h. In the sketch below the same drift effect is shown with a conventionalised machine. The wheels are merely adjusted so that the machine can continue without swing down the strip at the touch-down drift angle. The front wheel remains steerable for incidental course corrections.